MIDWEST CLAYPAN SOIL CONSERVATION EXPERIMENT FARM

Mc Credie, Missouri

You are invited to use this leaflet as a guide to tour the experiment farm. A brief description of experiments and results has been keyed to the map on page two by numbered stops. Drinking water is available at the farm shop building - Stop No. 2.

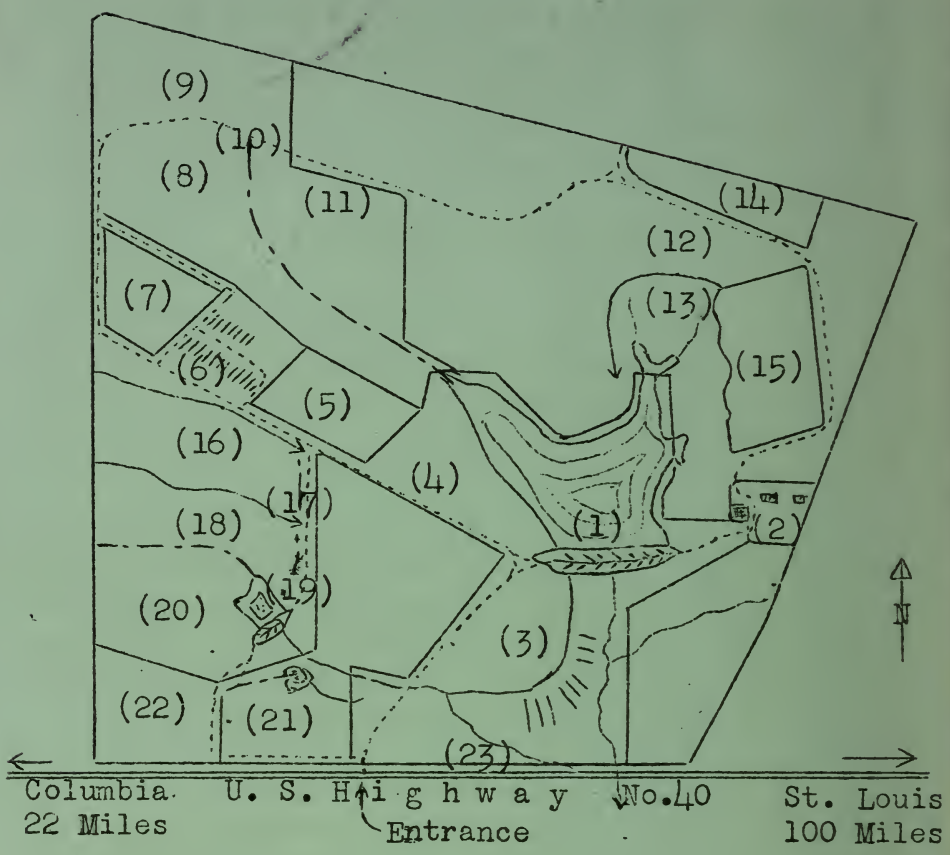
The soil is typical of the claypan soils of the Midwest. The name "claypan" comes from the tight layer of subsoil 9 to 15 inches below the surface, through which water passes very slowly. There are 5 million acres of these soils in Missouri, and another 5 million in adjoining states.

The experiments are designed to provide, through intensive study, solutions to problems faced by those engaged in putting soil conservation into practice on the land. Runoff and soil loss measurements were begun in 1940.

Additional information about specific experiments or soil conservation practices is available upon request. Correspondence is invited from groups desiring a conducted tour of the farm.

- Prepared in August, 1949 -

COOPERATIVE RESEARCH IN SOIL CONSERVATION
U.S.D.A., Soil Conservation Service
and
Missouri Agricultural Experiment Station, Columbia
D. D. Smith, Project Supervisor
D. M. Whitt, Soil Conservationist
Agricultural Engineering Building, Columbia, Mo.



(1) LAKE -

This reservoir, covering 16 acres, furnishes water for testing terrace outlet and waterway grasses. The object of the tests is to determine permissible water velocity and width and depth of channels required to carry the runoff from farm fields. The test channels of bluegrass, redtop, alta fescue, brome, and reed canary grass are located south and east of the supply channel below the dam. Bluegrass and redtop channels have been tested and outlet dimension tables prepared.

Permits for fishing in the lake may be obtained from S. R. Miles, Farm Foreman.

(2) FARMSTEAD -

Experiment farm office, shop building, and barn. Residence is occupied by the farm foreman.

(3) SUPPLEMENTAL IRRIGATION (15 plots) -

Study of supplemental irrigation was begun in 1948. Primary objectives are to determine the erosion hazards of irrigation on land subject to high intensity storms and to measure yield benefits resulting from adequate water. A corn - soybeans - wheat - clover and timothy rotation with and without soil treatment is now under test.

(4) STRIP CROPPING -

This is a field trial of strip cropping using soybeans as the cultivated crop and a grass legume meadow as the filter strip. Very little erosion has occurred on the field since it was established in 1942. Lime and 0-20-10 fertilizer increased the average bean yield 35 per cent.

(5) PASTURE PLOTS -

Here are 3 of the 11 pasture plots under study. They are 2 acres in size and are grazed by one- and two-year-old cattle. Bromegrass and sweet clover is a promising new mixture under measurement since 1947 - average annual beef production 316 pounds per acre. Timothy, bluegrass, sweet clover, and Korean lespedeza has averaged 262 pounds of beef per acre for the 9-year period 1940-48. An annual rotation of soybeans(grain) rye(pasture) is on the next plot. Beans have averaged 23 bushels, and rye 208 pounds of beef per acre. Soil loss is near 4 tons per acre, compared with 1/4 ton under timothy, bluegrass, sweet clover, and lespedeza.

(6) CROPPING SYSTEMS FOR SOIL CONSERVATION -

(41 Plots) The object of this experiment is to determine the effectiveness of different crops

and cropping systems in control of erosion. The tanks and other equipment at each plot are for measuring soil and water losses from the 19 rotations being studied. The results show that a soil conserving rotation must provide maximum soil cover with a minimum number of seedbed preparations and include a soil conditioning crop, or crops, immediately preceding the cultivated crop.

Soil fertility treatments are required to grow the quality of cover and soil conditioning crops necessary for effective erosion control. Present treatments consist of lime and phosphate (rock) in sufficient quantities to raise their concentration in the soil to satisfactory levels, nitrogen plowed under before corn, and applications of an N-P-K fertilizer drilled with all grain crops and on third year meadow. Treatments have more than doubled crop yields and have reduced erosion under small grain one-half.

The most effective soil conditioning to date has resulted from two years of grass and legume meadow. It reduced erosion under the corn that followed nearly 80%. With clover alone for hay or plowed under as green manure the reduction in erosion under the corn was 50%. The erosion control efficiencies measured for several of the cropping systems, based on a standard of efficiency, are:

Corn-oats (no treatment) - - - -	48%
Corn-oats and sweet clover - - - -	57%
Wheat and lespedeza (continuous) - -	65%
Corn-wheat-grass & legume meadow 1 yr.	67%
Corn-wheat-grass & legume meadow 2 yrs.	73%
Grass and legume pasture (continuous)	94%

Grain soybean and additional corn systems with the new soil treatments were begun during 1947.

(7) PASTURE PLOTS -

Wheat and lespedeza both pastured, with average

annual production of 302 pounds beef per acre, has been the highest producer under study. Each of the crops contributes about half this amount. The next plot, wheat removed for grain and lespedeza pastured, was placed under test in 1949. Around the corner may be seen an April 1949 seeding of alta fescue and birdsfoot trefoil. Soil treatment consisted of 1/2 ton rock phosphate plowed down and 300 pounds per acre of 8-8-8 as a starter.

(8) FIELD TRIAL OF CONSERVATION PRACTICES -

A 5-year rotation is being studied on 5 ten-acre fields of the farm. These fields provide testing and observational areas for field scale operations: seeding techniques, seed mixtures, seed production and harvesting, terracing, contouring, and other features of conservation farming. The rotation is corn or soybeans - wheat - 3 years of clover and grass mixture.

This is the first of such fields - the upper half in corn, the lower half in Chief soybeans. One-half ton of rock phosphate was plowed down on the field, and the corn area received 350 pounds per acre of ammonium nitrate before plowing.

(9) FIELD TRIAL OF CONSERVATION PRACTICES -

This field is in second-year meadow (1949). It was seeded to red and ladino clovers on the north half and to red clover and alfalfa on the south. Four grasses - brome, alta fescue, orchard, and timothy - were seeded west to east.

(10) WATER MANAGEMENT SYSTEM -

The terrace systems on these fields are designed for studying terrace size, cross section, and grade requirements for farming. Maintenance methods for grass outlet channels are also being investigated. Terraces on the east field have uniform grades of 2, 4, 6, and 8 inches. Periodic applications of superphosphate and nitrogen are

made on the outlet. It was established in 1945 without raising the phosphate level of the soil. Mowing the grass in the outlet channel for hay in mid June has been superior to July or later mowing.

(11) FIELD TRIAL OF CONSERVATION PRACTICES -

This field produced 84 bushels of corn an acre in 1948 and 13 bushels of wheat in 1949. Wheat was damaged by scab and rust. The legume seeding was made in the spring of 1949.

(12) UNIMPROVED AREA -

This soil is naturally low in phosphate and lime. Notice the poor vegetation where no soil treatment has ever been applied.

(13) RECLAMATION STUDY -

This was a badly gullied area reclaimed by diverting runoff, smoothing gullies, fertilizing, and contour seeding to grasses and legumes. Cost of the diversion and smoothing gullies amounted to about $27 an acre.

(14) PASTURE PLOT -

This 5-acre pasture was seeded to alta fescue and birdsfoot trefoil in the spring of 1947. A good stand of both was obtained, but the trefoil was lost by heaving in February of 1949. Fescue seems well adapted to this soil. It remains green late in the fall, and for that reason cattle prefer it to any other grass at that time of year.

(15) PASTURE PLOTS -

Of these 4 pastures 3 have not been plowed for nearly 50 years. The north one receives 0-20-10 periodically and 100 pounds/acre of ammonium nitrate in the fall and again in the spring. The next pasture receives no soil treatment. It has averaged 143 pounds of beef per acre in contrast to 196 pounds on the treated area.

The next pasture, ladino clover and bromegrass, received 3 tons per acre of lime in the subsoil and 6 tons of lime and 1 ton of rock phophate in the surface soil. The seeding was made on April 20, 1949, with 200 pounds per acre of 0-12-12 fertilizer. Grazing began on July 7, 1949 with two head per acre.

The south pasture was improved by liming, fertilizing with 0-12-12, disking, and seeding to birdsfoot trefoil. A fair stand of trefoil from a 1947 seeding was lost by heaving in February 1949. It was thoroughly disked and reseeded that spring.

(16) BUILDING A DEEPER SOIL -

The object of this study is to determine the effect on runoff, erosion, and crop yield of shattering and deep liming the upper claypan layer. The original plots of the study are at Stop No. 22. The deep treatment has been applied to the middle two terraced areas. The rotation is corn - wheat and sweet clover. Treatment consisted of 4 tons per acre of lime placed in the 9 to 16 inch layer when the subsoil was sufficiently dry to shatter. Surface treatment was uniform and included lime 5 tons per acre and colloidal phosphate one ton per acre in the top 9-inch layer. N-P-K fertilizer will be used on the corn and wheat. Nitrogen fertilizer and sweet clover will both be plowed under before corn.

(17) OUTLET ON SHATTERED & TREATED SUBSOIL -

The practice of deep liming and shattering was applied to this terrace outlet. The object is to develop a drought-resistant outlet requiring less maintenance fertilization and capable of higher design velocities. This outlet was ready for use 8 months after seeding.

(18) FIELD TRIAL OF CONSERVATION PRACTICES -

This field is in the process of development: terracing, liming, fertilizing, and plowing. It will go to corn and soybeans in 1950.

(19) GULLY CONTROL -

This structure controls an 11-foot overfall from a 45-acre drainage area and serves as a farm road. The diameter of tube required was reduced from 30 to 12 inches by utilizing spillway storage and an auxiliary grass flume.

(20) FIELD TRIAL OF CONSERVATION PRACTICES -

This field produced 24.4 bushels of wheat in 1948, and 2.13 tons of hay per acre the first cutting in 1949. The last cutting will be for seed.

(21) RECLAMATION AREA -

These areas were reclaimed in August, 1945. Cost of smoothing gullies, terracing, and outlet establishment was $21.47 per acre. The area was limed and manured at a cost of $31.16 per acre. Rye, in the 2-year rotation of rye - sweet clover, lespedeza and redtop, receives 0-14-7 fertilizer. The farming costs have totaled $37.13 per acre for the first 3 years. Returns from grazing have averaged $33.89 per acre per year after paying the total cost of reclamation and farming.

(22) BUILDING A DEEPER SOIL (27 plots) -

These are the original deep liming and shattering plots started in September 1941. The sweet clover root growth resulting from the deep treatment has been similar to that on a deep open soil. The annual increase in corn yield for the six-year period 1942-47 averaged 22%. It was more than 50% during the 3rd and 4th years after treatment. The plots were reshattered and relimed October, 1947.

(23) ALTA FESCUE TERRACE OUTLET -

The grass was sufficiently developed for use by May following the late September 1948 seeding. Manure, rock phosphate, and N-P-K starter fertilizer, but no lime, was used in the fall. Ammonium nitrate was applied in the spring. A hay crop was harvested in June, 1949.